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for the Behavioral and Social Sciences

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Overview of Practical Thinking Instruction for Battle Command

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U.S. Army Research Institute

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U.S. ARMY RESEARCH INSTITUTE FOR THE BEHAVIORAL AND SOCIAL SCIENCES

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Research Report 1685

Overview of Practical Thinking Instruction for Battle Command

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FOREWORD

The Fort Leavenworth Research Unit of the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) performs research on leadership and battle command. A recent initiative is the exploration of cognitive aspects of senior and tactical levels of command.

In August 1994, the Commander of the Training and Doctrine Command, GEN Frederick M. Franks, Jr., requested that ARI play a pivotal role in developing a course for mid-career Army officers. He asked that new instruction on thinking, reasoning, and deciding be developed for inclusion in a course on the Art of Battle Command. In 4 months the concept and content were completed by ARI researchers for the Command and General Staff Officers Course.

The major accomplishment to date is the development and transition of cognitive theory and findings from actual battle command studies to the instruction of thinking for command and staff work. The instruction departs from the systematic procedures suggested by classical models of decision making. Instead of prescribing a single sequence of steps, the approach considers how tactical commanders and staff actually make decisions and solve problems and identifies basic cognitive skills that support the natural ways of thinking.

The cognitive-based instruction was incorporated as a subcourse on Practical Thinking for the Battle Command Course. The Battle Command Course is an 180-hour advanced elective during Terms II and III that serves as the test bed of the Mobile Strike Force projected for the year 2015. In its inaugural implementation, Practical Thinking instruction was given to 73 senior captains and majors. This report summarizes why a cognitive approach was advocated, what practical thinking consists of, lessons learned from the implementation, and recommendations for the future.

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The Practical Thinking project was not possible without the efforts of many individuals. Mr. Rex Michel and Dr. James W. Lussier from ARI and LTC Harry McIntosh from the Command and General Staff College collaborated with the author on the development and instruction of the lessons. Their creativity, critical thinking, and persistence made this work possible. Ms. Julia Pounds, Consortium Research Fellows Program, provided assistance and advice throughout.

The assistance of other Fort Leavenworth ARI personnel was appreciated: Dr. Joan Silver, Dr. Delane Keene, and MAJ Lawrence "Clay" Miller. Dr. Stanley M. Halpin is also acknowledged for his role in championing the human dimensions approach for battle command.

Also, it is important to acknowledge those decision makers that agreed to try something that had not been done before. GEN Frederick M. Franks, Jr., Commander of the Training and Doctrine Command, agreed that there was cause to approach decision making differently and entrusted ARI with the mission. LTG John E. Miller, Commander Combined Arms Center; BG Randall L. Rigby, Deputy Commandant U.S. Army Command and General Staff College; and COL J. M. Kain, Director of the Center for Tactics, allowed this untried and unproven Practical Thinking program to be included in their most visible course. BG Geoffrey D. Miller, the Commander of the Mobile Strike Force, and LTC John Burdan, course author, admirably met the daily challenges of the battle command course that offered the context and *practical* problems that the instruction addressed.

OVERVIEW OF PRACTICAL THINKING INSTRUCTION FOR BATTLE COMMAND

EXECUTIVE SUMMARY

Research Requirement:

In August 1994 General Franks, then Commander U.S. Army Training and Doctrine Command (TRADOC), concurred with ARI study findings that indicated that Army leaders do not receive instruction in alternate ways of thinking. He requested that ARI develop a course on thinking based on their findings about actual tactical decision making. The course was directed to be a part of the Command and General Staff Officer Course (CGSOC) on battle command.

Procedure:

A cognitive skills approach was selected as the alternate way of teaching thinking. The subcourse and the skills are referred to as Practical Thinking. Cognitive skills were identified from a review of cognitive theories, cognitive skill instruction programs, and studies of tactical expertise and planning. The review of cognitive instruction programs revealed many skills and materials, but showed there were no existing cognitive programs targeted at specific jobs or job areas; they all addressed general areas. More specifically there was no related program of instruction applicable for mid-career Army officers that addressed the desired skills and Practical Thinking concepts for battle command.

Specific cognitive skills were identified by considering the basic types of questions that might be posed by battle commanders and staff, e.g., "*what is this situation?*" or "*what needs to be accomplished?*" The candidate skills were then screened for importance and their fit into available class time. Twelve hours of instruction organized into six lessons addressed the following topics:

1. How attitudes affect our thinking.
2. Ways to broaden perspectives.
3. How to adapt thinking to important aspects of a situation.
4. Concepts for identifying hidden assumptions.
5. Ways to resolve uncertainty through reasoning.
6. How to reason to integrate complex and disparate factors.

Four instructors presented the Practical Thinking instruction to 73 CGSOC students. The battle command course students also made up the staff for the notional Mobile Strike Force (MSF) '95 division. The students were responsible to a real Commander for working real problems. These problems included standard operating procedures; tactics, techniques, and procedures for year 2015 forces; and tactical plans for a series of tactical missions. The students also worked together to prepare for and conduct division-level warfighting exercises.

Findings:

A fundamental accomplishment of this Practical Thinking program was the development of the lesson materials. In this initial implementation, there was not sufficient time to integrate the Practical Thinking lessons fully with the rest of the battle command course or to familiarize the primary battle command course instructors with the concepts. Given the limited integration and reinforcement that was afforded the Practical Thinking concepts, they still had a positive effect. On the average, students' self-reports reflected a gain of 12.5 percent in expertise. Eighty percent (16 of 20) of the students who responded to an end of course survey felt that the course should be included in future CGSOC classes.

The application of Practical Thinking instruction to the battle command course can be improved in the future. Students need more practice trying the skills, and this can be encouraged by out-of-class assignments and more specific feedback. The Practical Thinking concepts can be reinforced throughout the battle command course when the primary battle command course instructors use them during their instruction and in after action reviews of student exercises.

Utilization of Findings:

The Practical Thinking instruction has been incorporated as a part of the premiere course on battle command. The Practical Thinking instruction can be extended to other CGSOC electives, other Army schooling, self-development materials, and for professional development seminars. As the Army realizes the need to increase reliance on critical and creative thinking skills, it becomes more important to define and try Practical Thinking instruction.

Beyond the Army applications, the cognitive skills that were identified and lessons that were developed can serve the basis for other adult instruction in complex decision making environments. The Practical Thinking course materials have already gained interest from national, state, and county law enforcement and fire fighting agencies.

OVERVIEW OF PRACTICAL THINKING INSTRUCTION FOR BATTLE COMMAND

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OVERVIEW OF PRACTICAL THINKING INSTRUCTION FOR BATTLE COMMAND

Introduction

Current doctrine and instruction for command and staff decision processes are based on classical models of decision making that are of questionable use (Fallesen, 1995; Klein, 1989). The tactical decision making process lays out sequential steps, recommends that multiple courses of action be generated, that each be assessed individually before any comparisons, that options be compared with rigorous analytic procedures, and then the best course of action selected. Although this process is taught, there are problems with the model. Fallesen (1993) provides ample evidence of problems associated with the traditional procedures (see Table 1). Battle commanders do not think or decide according to what those models prescribe. Emerging

Table 1.
C2 Performance Problems and Issues

Estimate Procedures Failure to follow procedures. Imprecise procedures. Inflexibility of estimate procedures. Excessive time demand.	Formulation of Alternatives Failure to track concepts. Generation of single alternatives. Inadequate concepts and contingencies.
Management of the Process Failure to include required staff (poor coordination). Inadequate Commander involvement. Poor management of the process.	Evaluation and Comparison of Alternatives Failure to evaluate. Serial evaluation of options. Reaching early decisions. Inadequate war gaming.
Information Exchange Failure to exchange information. Failure to present plans to commander. Failure to communicate interpretations.	Planning and Synchronization Incomplete planning. Poor planning.
Situation Assessment Failure to consider factors. Failure to verify assumptions. Failure to assess information quality. Failure to interpret information. Failure to make predictions.	Enacting Plans and Monitoring Poor orders dissemination. Failure to track the battlefield.
	Battle Success Staff characteristics related to effectiveness. Understanding related to effectiveness. Quality of procedures related to effectiveness.

findings and new theories of decision making show that the classical models provide limited and sometimes poor guidance (Fallesen, 1995; Klein, Orasanu, Calderwood & Zsombok, 1993). Traditional analytical approaches to tactical decision making procedures do not take into account the ingenuity and insight required on the battlefield.

Some use the concept of "intuition" to account for these skills that the traditional model does not address (Rogers, 1994). Others have proposed a recognitional process of perceiving familiar patterns (Klein, 1989) or creativity (Madigan & Dodge, 1994). Little attention and emphasis have been given to these or any other models as a basis for instruction on battle command or tactical decision making. Given that much of the most critical decision making does not conform to repeatable, analytical procedures and that alternate models exist, students who will be future battle commanders should be exposed to different models. The objective of this project was to explore how to define and teach alternate ways of thinking, reasoning, and deciding for battle command.

ARI proposed a model different from the traditional tactical decision making process in 1992 (Fallesen, Lussier & Michel). The battle command concept (Madigan & Dodge, 1994) adopted much of this model and summarizes the basics (see Table 2). The ARI proposed model impacted command and staff decision doctrine to include two alternatives to the deliberate decision making process. The combat and quick decision making procedures were added to account for the time available and the experience of the staff (FM 101-5, 1993). Under less time, less analysis is used, and with lower experience, there is greater need to involve the commander.

Table 2.
Battle Decision Making Activities

The battle commander and his staff need to share an understanding of battle decision making activities, why they are important, and what results from each. Tactical battle decision making is made up of three major activities: planning, directing, and monitoring. The activities should not be prescribed as a fixed sequence of procedures. Nor do the products have clear and definite end states. There are an endless number of ways in which the activities may be linked. Specific sequences will be determined by situational factors, including the strategies of the commander, whether hostilities are pending or in progress, the level of command, the capabilities of the threat, results from one activity determining what needs to be done next, and so on. The amount of effort required to perform various battle command activities and the thoroughness of resulting products are highly dependent on situational factors. Mission goals, time available, uncertainty, and experience determine what needs to be done and how it can be done.

- Visualization must be done proactively and should include forecasts of the end state. This requires the commander to maintain running estimates of the situation.
- Deriving an effective concept of the operation is much more than selecting the best option; it involves creating, refining, wargaming, and synchronizing the concept until it is adequately shaped into an operation plan or order.
- Deception planning must be integrated into the concept not added later as an after-thought.
- Because no mission ever goes exactly as planned, contingency planning – branches and sequels – is a measure of insurance, to anticipate and prepare for alternative future events.
- Rehearsals and brief-backs are essential in directing and ensuring understanding execution of plans.
- Monitoring must be done as the deliberate comparison of forecasted outcomes to ongoing events and subsequent adjustments.
- Since battle command processes cannot be prescribed as a set sequence of activities, time management, error-checking, and command and staff coordination need to be vigorously practiced to match activities to goals and the situation.

(Madigan & Dodge, 1994, p 29)

The charter for this project came about because of parallel interests of the Training and Doctrine Command (TRADOC) and ARI. At a Senior Leaders Conference in 1993, GEN Frederick M. Franks, Jr., Commander of TRADOC, asked the group, "what kind of research is being done in information processing and decision making?" He pointed out that what the Army says about how it makes decisions is not how it actually happens. ARI provided an information paper outlining our research on identifying relevant cognitive skills, distinguishing characteristics of expert decision making, and ways to build better decision aids. GEN Franks in turn requested ARI develop a battle command initiative to explain the art of battle command and determine how it can be formally transmitted and taught.

In nine months, ARI briefed GEN Franks on the findings of the study called The

Human Dimensions of Battle Command (Halpin, in preparation). The key *insight* of the study concerned the lack of explicit instruction on ways to improve thinking (see Table 3).

Table 3.
Insight on Alternate Instruction for Thinking

Insight: Army officers are not formally instructed in alternate ways of thinking, reasoning, and deciding.

So what: Perhaps the most critical asset that battle commanders possess are their abilities to think, reason, and decide. Battle commanders display -- and situations demand -- variety. Instruction should not advocate methods based on a single model.

What next: Identify the variability in leaders and determine how to enhance and supplement skills used in everyday thinking, reasoning, and deciding.

(Halpin, in preparation)

While ARI was advocating a research program to first determine specific decision maker qualities and styles using new models of thinking, GEN Franks asked that a battle command elective be developed immediately to focus on alternative ways of problem identification, formulation, and solution. CGSOC took the lead for the request and included ARI.

CGSOC combined this tasking with on-going efforts to explore tactics, force structure, staff organization, weapons requirements and information technology in the Mobile Strike Force (MSF), a notional division fighting in the year 2015. The resulting battle command course (A308) followed the course model from the previous year. A large group of students (73 in 1995) are assigned to staff positions on the MSF. The class works together to develop tactics, techniques, and procedures for the future division, and determines how to use the advanced weapons and information system prototypes. At the core of the course was an abbreviated subcourse on advanced maneuver, fires, intelligence, and logistics that other CGSOC students receive in entirety. The A308 students also received instruction in MSF concepts and experimental information technologies. Multi-session simulation exercises that follow the model of the Battle Command Training Program's warfighting exercises occur throughout the course.

To address the tasking on alternative ways of decision making, CGSOC included ARI's program of instruction on Practical Thinking and guest speakers. The Practical Thinking instruction shared the goal of *preparing students to perform tactical battle command* with the rest of the battle command course. The rest of the course was very much directed toward developing a viable MSF Division and staff, that would perform well in Prairie Warrior '95 and provide a test bed for warfighting concepts for the twenty-first century.

The Practical Thinking instruction took a new approach to the preparation of Army leaders. Unlike the current approaches that teach tactics or that teach general staff procedures, the Practical Thinking approach was based on identifying cognitive skills and attitudes that impact those skills. Others have pointed out the lack of emphasis on cognitive or conceptual skills.

The resultant procedures focus explicitly on technical skills, implicitly on interpersonal skills and, largely omit the development of the conceptual skills. . . . The current approach to

leader development that does not emphasize conceptual development is unlikely to provide leaders appropriately equipped to cope with the uncertainties and complexities of planning for and conducting warfare in the twenty-first century. (Kluever, Lynch, Matthies, Owens, & Spears, 1992, p 1-2.)

Another aspect that was emphasized was using adult learning theory in the design of the instruction. Since the target audience already has a good deal of knowledge and competency in the specific domain, an adult theory to education was applied. Under this andragogical model (Knowles, 1990) the responsibility for learning is on the students; they decide what is worthy of study and adoption.

Practical thinking was conceptualized to include aspects of both critical and creative thinking. Critical thinking is judgmental, cautious, and convergent. It checks on the sensibility, relevance, and relationship of meaning and possibility. Creative thinking is generative, daring, and divergent. Together they make up practical thinking that relates to the new naturalistic models (e.g., Klein et al., 1993) based on how people actually think and act. The use of the term *Practical Thinking* resulted from the realization that innovation and evaluation complement each other. In this sense, this is the practical way to approach thinking, rather than by classical or formal ways.

Practical thinking is an important and valid notion to contrast with formal thinking (see Table 4). Galotti (1989) identifies the characteristics of formal and everyday reasoning. Formal reasoning can occur when all premises are supplied, problems are well-bounded, and there is usually one correct answer. Everyday reasoning occurs when premises are implicit and some

Table 4.
Contrast of Formal and Practical Thinking

Aspect	Formal Thinking	Practical Thinking
Application	Well-bounded problems	Complex, everyday problems
Variation	General purpose	Tailored to circumstances, values, experience
Source of control	Theory dictates	Person determines how thinking best proceeds in each situation
Process	Convergent	Creative and discriminating
Orientation	Form, process oriented	Goal oriented
Foundation	All premises exist	Some premises are implied or missing
Knowledge	Knowledge exists or can be determined	Some level of uncertainty always exists
Goals	Goals are taken as given	Goals are determined. If they already exist, they are checked.
Outcome	Single answer exists and is found through application of the process	An answer might not occur or many acceptable answers might exist
Theoretical basis	Classical models, enforce rational decision making	Naturalistic, understand what makes people adaptive and effective

premises are not supplied at all, problems are not well-bounded, several possible answers might exist, established procedures rarely exist, there is uncertainty about the outcome of a solution--sometimes even after the solution is applied, and problems are solved as a means to further ends, not as ends in themselves. Scribner (1986) describes practical thinking in contrast to theoretical thinking. Practical thinking involves integrated mental processes directed toward some goal and performed in specific circumstances. Practical thinking ability involves adaptation to changing conditions of the circumstances and to the changing states of knowledge, purpose, and values of the person.

Approach

To achieve the project objective of defining and teaching better ways of thinking for battle command the overall approach was to emphasize practical thinking. The basis for the Practical Thinking program of instruction was to build on the strengths of how people reason naturally and informally in everyday situations. Important in this approach are the following points:

1. The knowledge a person has is the basis for thinking; procedures for decision making (e.g., steps or algorithms) are no short cut or replacement for experience.
2. Cognition, the way thinking is done, can be developed and improved through self-examination and practice of various cognitive skills.
3. Ways of thinking should be adapted to the situation at hand.

The goal of the Practical Thinking instruction is not to pump more facts into the students. Instead it aims to extend how students use what they already know to reason about what they need to know.

The ARI program of instruction departs from traditional approaches that have been grounded in analysis, probabilities, and formal logic. The attempts at analytical aiding have not been very useful. Traditional theories of decision making assume that solutions come from repeatable processes and can be clearly graded for optimality, but standard procedures or formulae are not satisfactory under most real-world circumstances. Naturalistic studies show that *ideal* decisions are unrealistic in complex, adversarial situations. Assigning probabilities to past and anticipated events in complex, uncertain environments does not show much promise either (Cohen, 1993), nor does teaching formal logic (Cheng, Holyoak, Nisbett & Oliver, 1986).

Practical Thinking instruction is a unique component of CGSOC instruction as it focuses on how individuals think, reason, and decide. It avoids giving recipes for the steps or analytical procedures for thinking, instead advocating a conscious effort to learn, adapt to situations, manage one's own thinking, an openness to other positions, flexibility in approaches to problems, using standards in thinking, and to think using overarching viewpoints.

Practical Thinking Skills

Practical thinking concepts were identified by establishing a number of propositions about how we learn and improve our reasoning. The propositions include issues like

1. One's skill at thinking can be improved.
2. Thinking is not always related to high scores on intelligence tests.
3. Reasoning errors can be decreased.
4. Thinking is goal-directed and done in context.
5. Models based on normative decision theory or formal logic are not very useful for improving practical thinking.
6. Instead of changing everyone to a single style of thinking, make people aware of the particular strengths, weaknesses, and safeguards of their style.

Fifteen cognitive instruction programs were reviewed to identify the thinking skills incorporated into their instruction and results of the instruction (Fallesen, Pounds, Breeskin &

Saxon, in preparation). The results from the various programs were generally positive, but were not as substantial as would be hoped. Positive results were indicated on some measures for some programs but not for other measures. For example, positive results were indicated for the Odyssey program (Harvard University, 1986) on the number of solution features and the amount of detail and for the Productive Thinking Program (Covington, Crutchfield, Davies & Olton, 1974) on fluency, better ideas, and detection of anomalies but not on better overall solutions.

[E]ducational evaluation is inherently difficult, and its results are seldom unequivocal; program developers have sometimes been sufficiently convinced of the merits of their approach that they have not been motivated to attempt an evaluation themselves. . . . Quantitative data on a few programs indicate that they produce modest improvements in performance on a variety of tests of mental ability. They make it clear that no one can yet assure the development of effective thinking skills in the classroom, but they reinforce the conviction that the goal is a reasonable one and that progress is being made in its pursuit. (Nickerson, 1984, p 36)

Bolstering skills and attitudes as general and as pervasive as those dealing with thinking is not easy to do, and the absence of overwhelming efficacy should not be discouraging. Most of the reviewed materials were targeted at younger students, and none of the existing programs had the desired combination of skills identified from the propositions and recent cognitive theories. The absence of existing cognitive programs was not unexpected, and reinforced the need for developing materials specifically to try to enhance the skills of mid-career Army officers.

Cognitive skills for inclusion in the Practical Thinking subcourse were identified from the consideration of the findings on battle command (e.g., Fallesen, 1993), cognitive theories (e.g., Klein et al., 1993), previous cognitive instruction programs (Fallesen, Pounds, Breeskin & Saxon, in preparation), and questions that battle commanders and staff might pose. The questions were those that in a reflective moment a person might ask him- or herself to make sure that thinking is on track. Questions like, "*what is this situation?*" or "*what needs to be accomplished?*" help identify important cognitive skills. These two questions relate to the cognitive skills of situation assessment and goal identification, respectively. Table 5 lists the various questions and skills that were identified.

Practical Thinking Lessons

At the same time skills were identified, lesson topics were chosen. Topics were chosen based on the number of lessons that could be scheduled and named according to what the students could easily relate to. Seventeen hours of instruction were developed for the following topics:

- Introduction
- Multiple Perspectives
- Adapting to Situations
- Finding Hidden Assumptions
- Practical Reasoning
- Integrative Thinking
- Skill Practice.

Table 5.
Problem Solving Skills Proposed for Battle Command

"Thinking" question	Related construct
What is this situation?	situation assessment, understanding
What is this situation like?	analogical reasoning
What isn't this situation like?	dialectical reasoning
What else could this situation/solution be?	creativity
Any assumptions not needed, new ones needed?	hidden assumptions
What is the real problem?	identification, definition, framing
What needs to be accomplished?	goals, planning
What do I know about situations like this?	assessment of own knowledge
How should I prepare for future situations?	learning to learn
What don't I know that I should?	using uncertainty
What do I still need to know?	missing information
How can I remember?	memory techniques
How could this situation happen?	explanation-based reasoning
What constraints are there?	constraint-based reasoning
What is likely?	plausible reasoning
What should I know?	learning to learn, attention, novelty
How to reason?	consistency, clarity, counter-arguments
What is the solution?	everyday reasoning
How should I think about this problem?	metacognition

The materials and instruction were based on an adult learning philosophy that places the responsibility for learning on the students, rather than a teacher-presented, student-recall approach (Knowles, 1990). This approach could not be used to the full extent possible, because of limited instruction time available, limitations of the Practical Thinking instructors in the context of the larger battle command course, and the students' limited familiarity with self-directed learning.

Methods of Instruction

Various methods of instruction were included in the program. Lectures, readings, exercises, discussions, and case studies were all used to try to keep the instruction dynamic and interesting. Many different types of cases and examples were used to keep the focus on the skill, rather than on the details of the specific problem. Examples included everyday situations, such as job interviews, buying a car, and choosing a course of college study. Examples also included domain specific situations such as lessons from Combat Training Centers, historical cases, borrowed and devised tactical problems, and specific problems that the students had to

address. Specific problems that the Mobile Strike Force (MSF) addressed in the Practical Thinking lessons included the application of critical reasoning standards to new weapon concepts, enemy campaign plans, and a tactical concept for simultaneous attack. Application of the Practical Thinking skills to the MSF led to lively discussions about the merits and faults of specific MSF concepts.

Description of Practical Thinking Lessons

Several aims were identified for developing the Practical Thinking material. Ultimately there was a desire to increase cognitive skills that would improve battle command performance. This was something for which the students would have to take primary responsibility. Accepting responsibility was largely a matter of understanding the need to change and improve. Attitudes were addressed to encourage understanding of the Practical Thinking rationale, concepts, and tools. The concepts were offered to impress upon students the importance to learn more than simple procedures or subject matter knowledge that are presented elsewhere in their education. Instruction stressed the students' desire to learn, to consider how they think, and to find and try out tools for thinking. Lessons were centered around obstacles to thinking and concepts for improving thinking. The instruction intentionally avoided the prescription of procedures for thinking. The materials introduced concepts and techniques for performing certain skills, like finding hidden assumptions. These concepts were used to illustrate different ways to think and were not meant to be prescriptive.

An example of obstacles to thinking is the problem with parochial and traditional views that keep new ideas from being thought about, tried, and implemented. The instruction included historical instances of parochial views and some of the reasons why they are held. Techniques were given for taking multiple perspectives, such as taking on other person's views and attitudes to see where they would lead, if they were true. Some components were included that were drawn from all of the cognitive instruction programs that were reviewed. The efforts were geared toward improving cognitive skill, especially metacognitive skill, informing about attitudes, and offering tools, heuristics, or guidelines for thinking.

The six lessons are briefly described in the following text and in Table 6. The lessons started with general overview, covered creative thinking, thinking about thinking, dialectical argumentation (possibility thinking), everyday and informal reasoning, and integrative thinking about putting an encompassing picture together. The order of lessons was selected to go from broad, familiar topics to more advanced and specific ones. The six lessons were spread out throughout the battle command course to accommodate other course elements.

The topics selected for the first Practical Thinking lesson provided an *Introduction* to the purpose of practical thinking, gave examples of the skills to be covered, and allowed the students to start to reflect on how they think and how others might think.

The second lesson was on *Multiple Perspectives*. It was intended to support the MSF course requirement to shift from the usual way of looking at things and to apply more creative processes and solutions. Attitudes, general guidelines, and specific techniques for shifting perspectives were presented and practiced through class exercises.

The third lesson was called *Adapting to Situations* and covered how the Practical Thinking skills related to the tactical decision making procedures taught elsewhere in CGSOC and how organizing one's thinking can be beneficial. A tool was offered for deciding how to adapt one's thinking to the situation. This lesson was focused on metacognition, but several of the instructors chose to provide more concrete discussions about making decisions under stress conditions.

The fourth lesson was on *Finding Hidden Assumptions*. Finding hidden assumptions was based on situation assessment research done by Cohen et al. (in preparation). Finding hidden

assumptions covered the problems associated with assumptions that are not apparent in a person's thinking. Finding hidden assumptions opens up the range of possibilities for what a situation is, what it means, why it might happen, and what to do about it. The nature of beliefs and their relationship to assumptions and "facts" were discussed as were unstated assumptions. A specific technique for finding hidden assumptions was discussed and practiced.

The fifth lesson was on *Practical Reasoning*. Practical reasoning covered the essence of practical thinking, problems or flaws in practical argument (i.e., the debate that goes on inside one's thought processes), standards of thinking one might use to avoid the flaws, how reasoning is affected by attitudes, and six general tools as prompts for deeper thinking.

The sixth lesson, *Integrative Thinking* included discussion of the characteristics of military expertise and stages characterized by different levels of reasoning sophistication. The lowest stage is characterized by the deference of the thinker to a person or other source (like published doctrine) in authority. This stage is characterized by the lack of critical and integrative thinking. The highest level is characterized by the ability to put complex understandings together in overarching views. The differences and similarities in levels were demonstrated with a car buying example that everyone could relate to. Students were also challenged to predict how someone at each integrative thinking level would respond to a tactical scenario with high situation and goal uncertainty.

The original allocation of instructional time and number of lessons was reduced because of other course demands. As a result, a planned lesson on Expertise was dropped, and the topic of expertise was included in the *Integrative Thinking* lesson. Also a final lesson on *Skill Practice* was shortened and taught immediately following the *Integrative Thinking* lesson. These changes and others caused the classroom contact to be reduced from a planned 17 to 12 hours. Future implementations should consider including additional instruction on expertise and increase opportunities for practicing the skills.

Table 6.
Summary of Practical Thinking Lessons

Lesson Topic	Basic Concepts	Purpose	Content Summary	Provisional Standards
Introduction	What are different ways of thinking? What are some of the key components of thinking?	Provide a course overview. Describe rationale and philosophy for instruction on practical thinking. Stimulate students to consider how they think. Establish expectations by providing an outline of course topics and initial introductory exercises.	Practical Thinking intends to capture the strengths of how we think for everyday problems, calling on experience more than formal models. Practical Thinking includes creative and critical elements. Thinking is a rich interchange among problems, possibilities, evidence, goals, and values. By being more mindful we can develop better thinking habits.	Change in thinking will be indicated by such things as a willingness to try out alternate approaches to thinking, being open to others' positions, being prepared to think about issues instead of ignoring or dismissing them, and asking insightful questions.
Multiple perspectives	Think outside the box. Thinking is often constrained with unnecessary boundaries.	Demonstrate ways to (a) broaden perspectives, (b) take different perspectives, or (c) find a better perspective when assessing situations, and solving problems.	Whenever we reason we do so within some frame of reference or perspective. Any defect or restriction in that perspective is a possible source of problems in reasoning. Taking multiple perspectives helps to understand situations, find new or creative solutions, and reason about solutions. The lesson describes 12 techniques for altering perspective, 9 guidelines, and 6 attitudinal elements.	Skilled performance will be characterized by (a) an openness to take different perspectives; (b) flexibility in finding potentially useful perspectives; (c) focus on most important elements of a situation, even if they go against common ways of looking at the situation; and (d) if solutions are not easily generated or if solution attempts fail, consideration of a variety of perspectives.
Adapting to situations	There isn't a single right procedure for thinking. Need to learn to be aware of how thinking progresses and how to guide your thinking deliberately.	Demonstrate the reasons why procedures need to be adapted, what factors provide the basis for adaptation, and ways to think about adaptation. Provide a bridge between formally taught tactical decision making procedures and the thinking skills to be emphasized in the subcourse.	Effective performance depends on adapting one's knowledge, experience, and styles to specific tasks and situations. To guide thinking we must think deliberately about how to solve problems and decide. This process is similar to decision triage. Use the GO-FTTE-WIN questions to remind how to plan your thinking: What are goals and obstacles of thinking? How familiar is the situation, how important, how much time is available, how much effort required for an acceptable level of effort? What's important now?	Thinking strategies will be matched to the situational demands and constraints of the problems. Behaviors indicating that the strategies have been developed include (a) willingness to maximize efficiency of thinking; (b) deliberate planning of how to think about and solve problems; (c) determining the most important things to think about; (d) making the best use of available time; (e) using what is already known in the best way possible; (f) monitoring and keeping track of progress made in thinking.

Table 6. (continued)

Lesson Topic	Basic Concepts	Purpose	Content Summary	Provisional Standards
Finding hidden assumptions	Some assumptions are hidden as "beliefs" when there is no factual basis for them. Practice asking "what else could this be"?	Increase awareness to assumptions that we make unknowingly. Provide techniques for identifying hidden assumptions and handling unexpected events.	Cases like Pearl Harbor, Bay of Pigs, Battle of the Bulge, Shuttle disaster indicate assumptions that were ignored or treated as facts. Check assumptions by applying the perfect intelligence source ("crystal ball") technique: what else could this be, what else could explain this? Once identified judge plausibility. Keep track of unexpected events, don't disregard them, explain them in accordance with other understandings.	Limits of understanding of problems will be improved in terms of completeness and thoroughness. Outcome indicators will be less surprise by own and threat capabilities and actions, increased consideration of possible events and corresponding contingency planning ("what if" thinking), and quicker and more accurate realization when events do not go as initially determined.
Practical reasoning	Limit the extent that attitudes influence reasoning unjustly and recognize when there is a failure to reason critically.	Make explicit what reasoning techniques are commonly used. This serves to demonstrate fallacies of arguments and different ways to reason. Describe and assess standards of reasoning, attitudinal pitfalls, and reasoning fallacies. Apply questions for quick starting reasoning.	Knowledge is key in reasoning. There are different ways to prepare for uncertainty, but uncertainty is inevitable. We can fill in our gaps of knowledge by creative and critical exploration. Standards: fairness, relevance, evidence, clarity, consistency. Pitfalls: rationalization, mind sets, attitudes, identification. Fallacies: magnitude, lack of knowledge, false dilemma, hasty generalization, hindsight bias, confirmation bias. Quick start: What if? What else? So what? What specifics? Is there a weak link? What is unexpected?	Practical reasoning ability will be marked by increased attention to the soundness, accuracy, and consistency of others' conclusions and in conclusions generated by one's self. Improve the use of practical reasoning by making it more explicit: increase (a) awareness of reasoning qualities and types of argumentation, (b) critical judgment of others' arguments, and (c) application of everyday logic to specific problems and beliefs.
Integrative thinking	Learn from experience. Understand cause and effect relationships. Put the big picture together.	Demonstrate differences in integrative thinking. Address how it is acquired, how it relates to expertise and intuition. Provide guidance for developing integrative thinking.	Integration - understanding the relationships among events and concepts. Differentiation - knowing when what we know doesn't apply. Levels: reliance on authority, awareness of complexity, reflection, emerging synthesis, and mastery. Improve integrative thinking by resolving uncertainties, spending more time understanding problems, applying Practical Thinking techniques, and practicing patience.	An increase in integrative thinking ability will be indicated by increased consideration of the level of knowledge, rules, and principles used in problems. Integrative characteristics will be important in one's thinking and in judging the viewpoints of others: exceptions to rules; increased tolerance of ambiguity; using situation uncertainty; identification of tension and interaction among alternatives; consideration of the dynamics in a situation; and synthesis of overarching viewpoints.

Findings

The goal of this Practical Thinking project was to determine and teach important cognitive skills for battle command. An explicit cognitive skill approach for instruction of mid-career Army officers has not been undertaken before to our knowledge. This created a challenge for relating abstract psychological concepts to practical concerns of battle command. The first part of the goal was clearly accomplished. Lesson materials were developed that discussed and described practical thinking for battle command (see Fallesen, Michel, Lussier & Pounds, in preparation for more detailed description of the lessons). The improvement of Practical Thinking skills by the students is a less tangible goal, though there are indications that the students benefitted from the instruction. This section describes reactions of students and instructors and thoughts for improving future Practical Thinking instruction.

Context for Instruction

To consider the impact of the instruction, one must consider the context in which Practical Thinking instruction occurred. The Practical Thinking instruction shared with the rest of the battle command course the goal of preparing students to perform tactical battle command. There were different intentions and approaches also. The rest of the Course was very much directed toward developing a viable MSF Division and staff, that would perform well in Prairie Warrior '95 and provide a test bed for warfighting concepts for the twenty-first century. While the students were able to operate as a Division staff in the Prairie Warrior '95 exercise, the applied approach was not always consistent with the themes of the Practical Thinking instruction. Practical Thinking instruction encouraged reflection, flexibility, discovery learning, critical and creative thinking for the practice of battle command.

Since the Practical Thinking concepts were newly organized and developed, the principal battle command course instructors and the MSF Commander did not have the full opportunity to consider the skill approach and its application to the MSF. The MSF Commander and principal instructors generally supported the goals and objectives of the Practical Thinking subcourse. However, due to lack of time for familiarization and training on the concepts, they did not incorporate Practical Thinking as much as was desirable. The students were discouraged from applying too much of their own ingenuity to maintain some consistency across staff procedures and tactical operations. The students did not consider and apply the Practical Thinking concepts very much to the MSF. One student said that the Practical Thinking concepts were not applicable because of the many conflicting agendas associated with the MSF.

Student Reactions

Given the limited integration, reinforcement, and attention that was afforded the Practical Thinking instruction, it still had a positive effect. ARI conducted a mid-course and end of course written survey of the students. On the average, student self-reports reflected a gain of 12.5 percent in expertise for the six lessons (see Figure 1). Of the students who responded to the end of course survey, eighty percent (16 of 20) felt that the course should definitely be included in future CGSOC classes. One of the 20 students felt that the Practical Thinking instruction was the best part of the battle command course and another hoped to receive

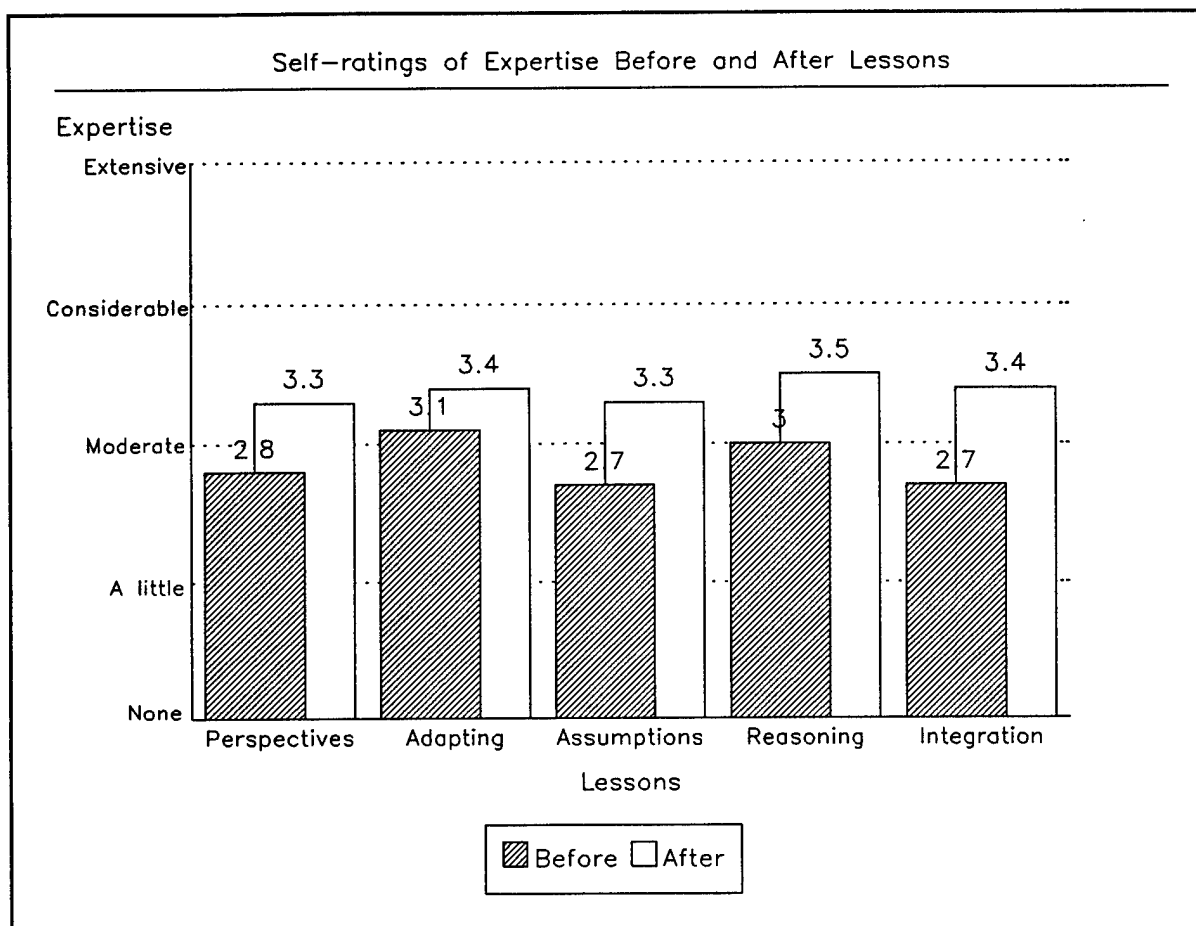


Figure 1. Self-reported expertise before and after instruction.

future lesson materials and self-development modules. Some wanted more opportunities and latitude to apply the concepts in the MSF. At least seventy-five percent felt the mix of theory and application, level of difficulty, and coverage of the topics was appropriate.

Four of the 20 regarded the intent and approach of the Practical Thinking lessons nonessential. They felt that the instruction would be appropriate earlier in their careers or that thinking as a Major is so ingrained that there is not much chance of changing it. There were additional unfavorable comments recorded on an CGSC overall course evaluation (Evaluation and Standardization Division, in preparation).

An additional concern for future implementation was the identification of a fuller set of cognitive skills. Fifteen similar topics were generated by the subcourse author. The students were asked which would be most important for additional lessons. They preferred the more applied topics (see Table 7), specifically, visualizing the battlefield, maintaining focus in crisis situations, and applying practical thinking to leadership. The second grouping of skills would be more compatible with the set already identified. They included learning and memory, implementing creative ideas, discovering problems, asking questions, and resolving conflicts. These topics were close behind the top three skills.

Table 7.
Ratings of Importance of Future Lesson Topics

Topic	Average Rating
Maintaining focus in crisis situations	3.3
Visualizing the battlefield	3.3
Applying practical thinking to leadership	3.2
Improving learning and memory skills	2.9
Implementing creative ideas	2.8
Discovering and recognizing problems	2.8
Asking questions to explore possibilities	2.7
Managing and resolving conflicts	2.7
Making predictions	2.6
Forming/testing hypotheses & working assumptions	2.6
Understanding the role of personality and emotions in thinking	2.6
Mentally simulating planned actions	2.5
Improving shared understanding	2.5
Using individual thinking skills in groups	2.5
Use representation techniques to structure problems	2.3
(1= Very unimportant. 4= Very important.)	

Instructor Insights

Instructors were polled by written questionnaire after the completion of each lesson. They felt that there was too much material to cover in the time allotted for some lessons and this resulted in too little time to practice the skills. They found that smaller groups of 8 to 12 students compared to the full class sizes of 18 allowed the skills to be considered more thoroughly. They also found that practical thinking is not so much taught as it is something that individuals need to actively pursue. Some students thought the concepts should be encouraged by their daily instructors instead of being taught just by the outside Practical Thinking instructors. Encouraging students to be self-reflective, critical thinkers requires special instructor skills that could be improved.

The Practical Thinking instructors observed the students during other aspects of the battle command course. Specifically they were observed during their development meetings for MSF tactics, techniques, and procedures and during planning, conduct, and after action reviews of their tactical exercises. The style of the Division and the student staff were influenced by the presence of a General Officer as their commander.

While this led to successful performance in the Prairie Warrior '95 exercise, the constraints on the students were not consistent with the themes of the Practical Thinking instruction. In the after action review of the battle command course, students acknowledged that they were discouraged from thinking creatively in their MSF assignments. The Adapting to Situations lesson brought out the need to personalize the skills and incorporate them into the standard procedures of an organization. In retrospect, the contrast between the Practical

Thinking concepts of reflection, flexibility, critical and creative thinking and those of consistent organizational practices provided an opportunity and challenge to the students to deal with the conflict in the ways of thinking. Unexpectedly they had to resolve how much to pursue their own ways of thinking against the demands and constraints placed on them by the organization.

Recommendations

Combining the students' responses to the course survey and the insights from the developers, five tracks are recommended for future work. The first is a continuation of Practical Thinking lessons in the battle command course. The Practical Thinking lessons provide a good complement to the very applied nature of what the students are required to do as part of the MSF. The Practical Thinking lessons encourage the students to advance their skills in real contexts. The Practical Thinking teaching points can be better integrated into future battle command courses, since the primary battle command course instructors will have a better opportunity to examine and reinforce the materials. Secondly, a separate elective would be a good medium for the Practical Thinking lessons, since the students were somewhat divided in their reactions. The concepts should also be tried out during earlier periods of an officer's career, e.g., an Advanced Officer Course. A fourth implementation alternative is to pursue development of the material as a series of self-development modules. Since the material is focused on individuals it makes sense to format the instruction as self-paced material. With adequate resources, there is no reason not to pursue these extensions simultaneously.

The above four suggestions all assume that all Army officers are able to improve their current level of Practical Thinking skills. It is possible that some officers are less able, or even unable, to grasp and integrate these concepts into their cognitive toolkits. A fifth direction for follow-on work is a more fundamental research project to explore measures of cognitive style and cognitive flexibility, and to determine whether it is possible to distinguish those individuals without potential for flexible, innovative practical thinking.

Because the Practical Thinking approach was not prescriptive, directed feedback about students' thinking also would be useful. External feedback would be useful because problem solvers are not always aware of their attitudes and skill level. While an objective paper-and-pencil test of thinking is one obvious approach, most so-called tests are not compatible with practical thinking. If the propositions of the Practical Thinking approach are correct, a logical reasoning test would not be of much benefit to students. Practical thinking is done by a specific individual in a specific context for a specific purpose. Insight into one's particular styles of thinking should be more useful than just results on logical reasoning. Instead of using reasoning tests, cognitive style frameworks and methods should be explored and tried that would offer a student some insight into his or her particular style.

Conclusions

The Practical Thinking instruction has been incorporated as a part of the premiere course on battle command. Since an alternate approach to battle command instruction was developed and tried with CGSOC students, the goals of the project were met. It would be desirable to consider that the Practical Thinking students will be better battle commanders and staff officers because of the additional instruction. Although student self-reports support this expectation, claims to its efficacy are not certain. As was pointed out with the excerpt from Nickerson (1984), evaluation of cognitive instruction is inherently difficult because of the problem of measuring outcomes. The measurement problem is compounded when considering future performance in the complex and dynamic jobs required of commanders and staffs. There are sufficient reasons to believe that the goal of improving practical thinking is reasonable. Such a nontraditional goal will not occur without careful and repeated attempts.

The application to the battle command course can be improved from the findings of this first trial course. Students need more practice trying the skills. Practice can be encouraged by out-of-class assignments, more specific feedback, and endorsement and integration by military instructors and commanders. The Practical Thinking concepts can be reinforced throughout the battle command course by adoption of the concepts and use in after action reviews of student exercises. The Practical Thinking instruction can be extended to other CGSOC electives, other Army schooling, self-development materials, and for professional development seminars. The Practical Thinking skills and the cognitive approach advocated here do not need to be limited to battle command, but can be expanded to other functional areas, such as fire support, intelligence, and logistics and to Army readiness issues such as budgeting, personnel policies, downsizing, and training policies.

Beyond the Army applications, the cognitive skills that were identified and lessons that were developed for them can serve the basis of other adult instruction in complex decision making environments. The Practical Thinking course materials have already gained interest from national, state, and county law enforcement and fire fighting agencies. Up until the recent increased attention in naturalistic approaches, there were few innovations in training decision making. Now with the development of this instruction, largely based on creativity, critical thinking, and everyday reasoning there are alternative ways that intend to improve decision making beyond formal logic, normative-based decision aids, and multi-purpose procedures.

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